AIR QUALITY STUDY

INTERSTATE 10/CHERRY AVENUE INTERCHANGE

$PM_{2.5}$ AND PM_{10} ANALYSES

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INTRODUCTION

LSA Associates, Inc. (LSA) has prepared this particulate matter analysis for the Interstate 10 (I-10)/ Cherry Avenue Interchange Project. This analysis is prepared in response to the Environmental Protection Agency's (EPA) new $PM_{2.5}$[1] and PM_{10}[2] hot-spot analysis requirements in its March 10, 2006, final transportation conformity rule (2006 Final Rule) (71 FR 12468). The 2006 Final Rule supersedes the Federal Highway Administration's (FHWA) existing September 12, 2001, "Guidance for Qualitative Project-Level: Hot-spot Analysis in PM_{10} Nonattainment and Maintenance Areas." This technical addendum addresses these new requirements.

$PM_{2.5}$ AND PM_{10} HOT-SPOT METHODOLOGY

The 2006 Final Rule establishes the transportation conformity criteria and procedures for determining which transportation projects must be analyzed for local air quality impacts in $PM_{2.5}$ and PM_{10} nonattainment and maintenance areas. The proposed project is located in the South Coast Air Basin (Basin), which has been designated as a federal nonattainment area for both $PM_{2.5}$ and PM_{10}; therefore, a hot-spot analysis is required for both pollutants.

A hot-spot analysis is defined in the Code of Federal Regulations (CFR) (40 CFR 93.101) as an estimation of likely future localized $PM_{2.5}$ or PM_{10} pollutant concentrations and a comparison of those concentrations to the relevant air quality standards. A hot-spot analysis assesses the air quality impacts on a scale smaller than an entire nonattainment or maintenance area, including, for example, congested roadway intersections and highways or transit terminals. Such an analysis is a means of demonstrating that a transportation project meets Clean Air Act conformity requirements to support State and local air quality goals with respect to potential localized air quality impacts. When a hot-spot analysis is required, it is included within the project-level conformity determination that is made by the FHWA or the Federal Transit Administration (FTA).

Clean Air Act Section 176(c)(1)(B) is the statutory criterion that must be met by all projects in nonattainment and maintenance areas that are subject to transportation conformity. Section 176(c)(1)(B) states that federally supported transportation projects must not "cause or contribute to any new violation of any standard in any area; increase the frequency or severity of any existing violation of any standard in any area; or delay timely attainment of any standard or any required interim emission reductions or other milestones in any area."

Ambient Air Quality Standards (AAQS). $PM_{2.5}$ nonattainment and maintenance areas are required to attain and maintain two standards:

- 24-hour standard: 65 micrograms per cubic meter ($\mu g/m^3$)
- Annual standard: 15.0 $\mu g/m^3$

The current 24-hour standard is based on a 3-year average of the 98th percentile of 24-hour $PM_{2.5}$ concentrations; the current annual standard is based on a 3-year average of annual mean $PM_{2.5}$ concentrations. A $PM_{2.5}$ hot-spot analysis must consider both standards unless it is determined for a

[1] Particulate matter less than 2.5 microns in diameter.
[2] Particulate matter less than 10 microns in diameter.

given area that meeting the controlling standard would ensure that Clean Air Act requirements are met for both standards. The interagency consultation process should be used to discuss how the qualitative $PM_{2.5}$ hot-spot analysis meets statutory and regulatory requirements for both $PM_{2.5}$ standards, depending on the factors that are evaluated for a given project.

PM_{10} nonattainment and maintenance areas are required to attain and maintain two standards as well:

- 24-hour standard: 150 $\mu g/m^3$
- Annual standard: 50 $\mu g/m^3$

The 24-hour PM_{10} standard is attained when the average number of exceedances in the previous three calendar years is less than or equal to 1.0. An exceedance occurs when a 24-hour concentration of 155 $\mu g/m^3$ or greater is measured at a site. The annual PM_{10} standard is attained if the average of the annual arithmetic means for the previous three calendar years is less than or equal to 50 $\mu g/m^3$. A PM_{10} hot-spot analysis must consider both standards unless it is determined for a given area that meeting the controlling standard would ensure that Clean Air Act requirements are met for both standards. The interagency consultation process should be used to discuss how the qualitative PM_{10} hot-spot analysis meets statutory and regulatory requirements for both PM_{10} standards, depending on the factors that are evaluated for a given project.

To meet statutory requirements, the 2006 Final Rule requires $PM_{2.5}$ and PM_{10} hot-spot analyses to be performed for Projects of Air Quality Concern (POAQC). The 2006 Final Rule states that projects not identified in 40 CFR 93.123(b)(1) as projects of air quality concern have met statutory requirements without any further hot-spot analyses (40 CFR 93.116[a]).

$PM_{2.5}$ AND PM_{10} HOT-SPOT ANALYSIS

The following analysis has been conducted to determine whether the proposed project constitutes a POAQC.

POAQC

The first step in the hot-spot analysis is to determine whether a project meets the standard for a POAQC. The EPA specified in 40 CFR 93.123(b)(1) of the 2006 Final Rule that POAQC are certain highway and transit projects that involve significant levels of diesel vehicle traffic, or any other project that is identified in the $PM_{2.5}$ and PM_{10} State Implementation Plan (SIP) as a localized air quality concern. The 2006 Final Rule defines the POAQC that require a $PM_{2.5}$ and PM_{10} hot-spot analysis in 40 CFR 93.123(b)(1) as:

i. New or expanded highway projects that have a significant number of or significant increase in diesel vehicles

ii. Projects affecting intersections that are at Level of Service D, E, or F with a significant number of diesel vehicles, or those that will change to Level of Service D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project

iii. New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location

iv. Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location

v. Projects in or affecting locations, areas, or categories of sites which are identified in the $PM_{2.5}$ and PM_{10} applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation

Proposed Project

The proposed project was discussed at the July 25, 2006, Transportation Conformity Working Group (TCWG) meeting. Due to the high percentage of diesel trucks along Cherry Avenue and the increase in vehicle trips associated with the proposed project, the TCWG determined that the project is a POAQC, and $PM_{2.5}$ and PM_{10} hot-spots analyses are required.

Types of Emissions Considered

In accordance with the "Transportation Conformity Guidance for Qualitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas" (Guidance) developed by the EPA in conjunction with the FHWA in March 2006, this hot-spot analysis will be based only on directly emitted $PM_{2.5}$ emissions. Tailpipe, brake wear, and tire wear $PM_{2.5}$ emissions will be considered in this hot-spot analysis.

Vehicles cause dust from paved and unpaved roads to be reentrained, or resuspended, in the atmosphere. According to the 2006 Final Rule, road dust emissions are only to be considered in $PM_{2.5}$ hot-spot analyses if the EPA or the State air agency has made a finding that such emissions are a significant contributor to the $PM_{2.5}$ air quality problem (40 CFR 93.102(b)(3)). The EPA or the California Air Resources Board (ARB) has not yet made such finding of significance; therefore, the reentrained $PM_{2.5}$ is not considered in this analysis.

Secondary particles formed through $PM_{2.5}$ precursor emissions from a transportation project take several hours to form in the atmosphere, giving emissions time to disperse beyond the immediate project area of concern for localized analyses; therefore, they will not be considered in this hot-spot analysis. Secondary emissions of $PM_{2.5}$ are considered as part of the regional emission analysis prepared for the conforming Regional Transportation Plan (RTP) and Federal Transportation Improvement Program (FTIP).

According to the project schedules, construction will not last more than 5 years, and construction-related emissions may be considered temporary; therefore, any construction-related $PM_{2.5}$ emissions due to this project will not be included in this hot-spot analysis. This project will comply with the South Coast Air Quality Management District (SCAQMD) Fugitive Dust Rules for any fugitive dust emitted during the construction of this project. Excavation, transportation, placement, and handling of excavated soils will result in no visible dust migration. A water truck or tank will be available within the project limits at all times to suppress and control the migration of fugitive dust from earthwork operations.

Analysis Method

This hot-spots analysis relies on air quality data from monitoring stations within the proposed project area. This data is compared with AAQS and examined for trends in order to predict future conditions in the project vicinity. Additionally, the impacts of the project are discussed as well as the likelihood of these impacts interacting with the ambient $PM_{2.5}$ and PM_{10} levels to cause hot spots.

Data Considered

Baseline Pm_{10} Emissions. The monitored PM_{10} concentrations at the Fontana-Arrow Highway Station and at the San Bernardino-4th Street Station, shown in Table A (the two closest stations monitoring PM_{10}), indicate that the federal 24-hour PM_{10} AAQS (150 $\mu g/m^3$) were not exceeded between 2003 and 2005. The federal annual AAQS (50 $\mu g/m^3$) were exceeded once (by 0.8 $\mu g/m^3$) at the Fontana Station in 2005.

Table A: Ambient PM_{10} Monitoring Data

	2003		2004		2005	
	Date	**$\mu g/m^3$**	**Date**	**$\mu g/m^3$**	**Date**	**$\mu g/m^3$**
Fontana-Arrow Highway AQ Station						
First high	Sep 30	101	Oct 6	106	Jul 15	108
Second high	Oct 6	101	Jul 26	86	Mar 11	102
Third high	Dec 5	90	Aug 31	86	Nov 30	86
Fourth high	May 27	83	Sep 24	73	Sep 19	83
No. days above national 24-hour standard (150 $\mu g/m^3$)		0		0		0
National annual average		44.4		47.7		50.8
Exceeded national annual average standard (50 $\mu g/m^3$)?		No		No		Yes
San Bernardino-4th Street AQ Station						
First high	Oct 6	98	Mar 22	118	Aug 8	72
Second high	Oct 24	89	Apr 9	95	Sep 19	72
Third high	Sep 30	79	Oct 6	93	Sep 7	64
Fourth high	Jun 2	77	Aug 13	77	Aug 2	62
No. days above national 24-hour standard (150 $\mu g/m^3$)		0		0		0
National annual average		43.2		46.9		40.7
Exceeded national annual average standard (50 $\mu g/m^3$)?		No		No		No

ARB Web site: http://www.arb.ca.gov/adam/welcome.html, August 2006.

The 2003 Air Quality Management Plan (AQMP) published by SCAQMD reports that the Basin is expected to be in attainment for federal PM_{10} standards by the end of 2006. Tables 2-23 and 2-25 on pages V-2-57 and V-2-58, respectively, in Appendix V of the 2003 Air Quality Management Plan (AQMP) show the projected maximum 24-hour average PM_{10} concentrations for the Fontana area to be 128.4 and 116.2 $\mu g/m^3$ for 2006 and 2010, respectively. Tables 2-17 and 2-28 on pages V-2-49 and V-2-60, respectively, show the projected annual average PM_{10} concentrations for the Fontana area to be 47.2 and 45.0 $\mu g/m^3$ for 2006 and 2010, respectively. This decrease in emissions in the future is largely due to continued improvements in emissions control technologies. To estimate what the background PM_{10} concentration will be in 2025, a straight-line projection was made from the

2006 and 2010 values, predicting an ambient concentration of 70.5 and 36.8 µg/m^3 by 2025 for the 24-hour and annual standards, respectively.

Baseline $PM_{2.5}$ Emissions. The monitored $PM_{2.5}$ concentrations at the Fontana-Arrow Highway Station and at the San Bernardino-4th Street Station are shown in Table B. The data shows that the federal 24-hour $PM_{2.5}$ AAQS (65 µg/m^3) have not been exceeded at the Fontana Station in the last three years and were exceeded only once, in 2004, at the San Bernardino Station. The annual average $PM_{2.5}$ at both stations exceeded the federal standard (15 µg/m^3) in all three years; however, the concentrations continue to diminish every year.

Table B: Ambient $PM_{2.5}$ Monitoring Data

	2003	2004	2005
	µg/m^3	µg/m^3	µg/m^3
Fontana-Arrow Highway AQ Station			
3-year average 98th percentile	54	63	48
Exceeds federal 24-hour standard (65 µg/m^3)?	No	No	No
Annual average	22.1	19.9	18.8
Exceeds federal annual average standard (15 µg/m^3)?	Yes	Yes	Yes
San Bernardino-4th Street AQ Station			
3-year average 98th percentile	58	72	43
Exceeds federal 24-hour standard (65 µg/m^3)?	No	Yes	No
Annual average	22.2	21.9	17.3
Exceeds federal annual average standard (15 µg/m^3)?	Yes	Yes	Yes

EPA Web: http://www.epa.gov/air/data/monvals.html?st~CA~California, August 2006.

While the current levels of $PM_{2.5}$ in the project vicinity are generally below the federal 24-hour standard, indications are that levels in the future will decrease even more. To estimate what the background $PM_{2.5}$ concentration will be in 2025, a straight-line projection was made of the Fontana-Arrow Highway levels. This predicts that the $PM_{2.5}$ concentration would be approximately 17 µg/m^3 by 2025, which is approximately 26 percent of the federal 24-hr $PM_{2.5}$ standard.

Based on the 2006 and 2030 emission rates generated by the EMFAC2002 model, the improvements in engine technologies and emission controls will reduce the $PM_{2.5}$ and PM_{10} grams per mile vehicle emissions by 30 percent. This reduction in emission rates will aid in the continued reduction in the fugitive dust emission concentrations within the Basin and assist in attaining the federal air quality standards.

Traffic Changes Due to the Proposed Project. The proposed project is a highway interchange improvement project that increases the capacity of Cherry Avenue. This type of project improves freeway mainline and interchange operations by reducing traffic congestion and improving ingress/egress movements. Table C shows that, based on the Traffic Analysis (Meyer, Mohaddes

Associates, October 2005), all the Build Alternatives would result in an overall increase in traffic volumes on Cherry Avenue; however, as shown in Tables D through F, the proposed project would improve the level of service (LOS) and reduce the delays at the intersections within the project area. Thus, the efficiency of the traffic flow would be better for all the Build Alternatives compared to the No Build Alternative. Improved traffic flow efficiency is directly related to vehicle engine operating efficiency, which directly affects pollutant emission rates, including $PM_{2.5}$ and PM_{10}.

Table C: 2030 Average Annual Daily Traffic Volumes (AADT/Truck AADT)

Roadway Link	Without Project Traffic Volumes	Alternative 5 Traffic Volumes	Alternative 6 Traffic Volumes
Cherry Avenue north of Valley Boulevard	23,600/2,832	29,900/3,588	29,900/3,588
Cherry Avenue between Valley Boulevard and Westbound I-10 Ramps	27,400/3,288	34,200/4,104	34,200/4,104
Cherry Avenue between Westbound I-10 Ramps and Eastbound I-10 Ramps	27,700/3,324	38,400/4,608	38,400/4,608
Cherry Avenue between Eastbound I-10 Ramps and Slover Avenue	21,300/2,556	39,800/4,776	39,800/4,776
Cherry Avenue South of Slover Avenue	10,000/1,200	32,100/3,852	32,100/3,852

Source: Meyer, Mohaddes Associates., October 2005.

Table D: 2030 without Project (Alternative 1) Intersection Levels of Service

	Intersection	AM Peak Hour			PM Peak Hour		
		V/C	Delay (sec)	LOS	V/C	Delay (sec)	LOS
1.	Cherry Avenue/Valley Boulevard	0.96	45.4	D	1.16	83.8	F
2.	Cherry Avenue/I-10 WB Ramps	1.29	90.5	F	1.31	108.9	F
3.	Cherry Avenue/I-10 EB Ramps	1.67	184.0	F	1.32	105.0	F
4.	Cherry Avenue/Slover Avenue	0.92	37.1	D	0.85	34.3	C

Notes:
V/C = Volume/Capacity Ratio
LOS = Level of Service

Table E: 2030 with Proposed Project (Alternative 5) Intersection Levels of Service

	Intersection	AM Peak Hour			PM Peak Hour		
		V/C	Delay (sec)	LOS	V/C	Delay (sec)	LOS
1.	Cherry Avenue/Valley Boulevard	0.74	29.7	C	0.83	34.0	C
2.	Cherry Avenue/I-10 WB Ramps	0.78	25.5	C	0.61	19.9	B
3.	Cherry Avenue/I-10 EB Ramps	0.62	17.1	B	0.84	24.0	C
4.	Cherry Avenue/Slover Avenue	0.77	21.6	C	0.86	30.8	C

Notes:
V/C = Volume/Capacity Ratio
LOS = Level of Service

Table F: 2030 with Proposed Project (Alternative 6) Intersection Levels of Service

	Intersection	AM Peak Hour			PM Peak Hour		
		V/C	Delay (sec)	LOS	V/C	Delay (sec)	LOS
1.	Cherry Avenue/Valley Boulevard	0.74	29.7	C	0.83	34.0	C
2.	Cherry Avenue/I-10 WB Ramps	0.63	17.8	B	0.50	14.1	B
3.	Cherry Avenue/I-10 EB Ramps	0.62	17.1	B	0.84	24.0	C
4.	Cherry Avenue/Slover Avenue	0.77	21.6	C	0.86	30.8	C

Notes:
V/C = Volume/Capacity Ratio
LOS = Level of Service

Table G shows the a.m. and p.m. peak-hour intersection traffic volumes for each of the future build alternatives. As shown, the traffic volumes for the two Build Alternatives would be substantially higher than the volumes for the No Build Alternative. However, when the data from Table G is combined with the intersection delays from Tables D through F, it is possible to calculate the total peak-hour vehicle delay for each scenario. The intersection vehicle delays for each alternative are shown in Table H.

Table G: 2030 Intersection Volumes

Intersection	Alternative 1 (No Build)		Alternative 5		Alternative 6	
	AM	PM	AM	PM	AM	PM
Cherry Avenue/Valley Boulevard	5,138	6,069	5,429	6,547	5,429	6,547
Cherry Avenue/I-10 WB Ramps	3,884	3,405	4,864	4,462	4,405	4,036
Cherry Avenue/I-10 EB Ramps	3,590	3,376	4,693	5,017	4,694	5,017
Cherry Avenue/Slover Avenue	3,418	3,431	4,841	5,406	4,841	5,406

Table H: 2030 Intersection Delays (Hours)

Intersection	Alternative 1 (No Build)		Alternative 5		Alternative 6	
	AM	PM	AM	PM	AM	PM
Cherry Avenue/Valley Boulevard	64.8	141.3	44.8	61.8	44.8	61.8
Cherry Avenue/I-10 WB Ramps	97.6	103.0	34.5	24.7	21.8	15.8
Cherry Avenue/I-10 EB Ramps	183.5	98.5	17.5	33.4	17.5	33.4
Cherry Avenue/Slover Avenue	35.2	32.7	29.0	46.3	29.0	46.3
Total Hours	**381.1**	**375.5**	**125.8**	**166.2**	**113.1**	**157.3**

Based on the 12 percent truck trips along Cherry Avenue, the 2030 $PM_{2.5}$ and PM_{10} emission rates from EMFAC2002, and the intersection delays, the total fugitive dust idling emissions were calculated for each alternative. The results of the idling emissions calculations are shown in Table I.

Table I: Fugitive Dust Idling Emissions (pounds)

Pollutant	Alternative 1 (No Build)	Alternative 5	Alternative 6
$PM_{2.5}$	0.16	0.06	0.06
PM_{10}	0.17	0.07	0.06

As shown, the idling emissions for the two Build Alternatives are substantially lower than the emissions generated by the future No Build Alternative. Implementation of the proposed project would reduce fugitive dust idling emissions by 60 percent.

CONCLUSION

It is not expected that changes to $PM_{2.5}$ and PM_{10} emissions levels associated with the proposed project would result in new violations of the federal air quality standards for the following reasons:

- The future truck traffic volumes along Cherry Avenue would not exceed 10,000 average daily traffic (ADT)
- The ambient PM_{10} concentrations have not exceeded the 24-hour federal standard within the past three years and only exceeded the annual standard once in 2005.
- Based on the projected PM_{10} concentrations listed in the 2003 AQMP, the annual and 24-hour PM_{10} concentrations would be 74 percent and 47 percent of the federal standards by 2025, respectively.
- The ambient $PM_{2.5}$ concentrations exceeded the 24-hour federal standard only once within the past three years.
- Based on the local monitoring data, the 24-hour $PM_{2.5}$ concentrations would be reduced to approximately 26 percent of the federal standard by 2025. The annual average $PM_{2.5}$ concentrations within the project area would be reduced to below the federal standard by 2010.
- By 2030 the intersections within the proposed project area will be operating at LOS C through F without improvements. The proposed build alternatives would improve the LOS to B through C.
- Implementation of the proposed project would reduce fugitive dust idling emissions by 60 percent.

For these reasons, future new or worsened $PM_{2.5}$ and PM_{10} violations of any standards are not anticipated; therefore, the project meets the conformity hot-spot requirements in 40 CFR 93-116 and 93-123 for both $PM_{2.5}$ and PM_{10}.